

1       Claims:

2       What is claimed, is:

3       1.     A method comprising optimizing a data path and forwarding data from a start node  
4       to an end node over a network,

5                wherein the network comprises first nodes, each first node being capable  
6                to perform one or more first node functions,

7                wherein one or more of said first node functions are to be applied on said  
8                data while forwarding said data through the network,

9                wherein a number of data path options through the first nodes are  
10              determined, for each data path option, the first nodes, having one or more  
11              assigned first node functions,

12              wherein a first capacity value for each of said first nodes and for each of  
13              said first node functions and/or combinations of said first node functions  
14              are provided; and

15              wherein the data is forwarded through the data path which is determined  
16              by the data path option having a minimum overall capacity regarding the  
17              first capacity values;

18              characterized in that said one or more of said first nodes comprises one or more  
19              second nodes each of the second nodes assigned to one of the first nodes is  
20              capable to perform one or more second node functions, wherein said first node  
21              functions of the first nodes are provided by said second node functions,  
22              wherein providing one of said first capacity values for one specific first node and  
23              for one specific first node function and/or one specific combination of said first  
24              node functions, including the following steps:

25              - determining a number of second data path options for the second nodes of the  
26              one specific first node to perform said one specific first node function, for each  
27              second data path option, the second nodes having one or more assigned second  
28              node functions,

- 1           - providing second capacity values for each of said second nodes and for each of  
2           said assigned second node functions;  
3           - determining the overall capacity values of said second data path options with  
4           regard to the second capacity values;  
5           - determining the minimum overall capacity value of any of said second data path  
6           options; and  
7           - providing the minimum overall capacity value as the first capacity value.  
8
- 9       2.    A method according to claim 1, wherein the first node is included in a first network  
10       layer and/or the second node is included in a second network layer.
- 11       3.    A method according to claim 1, wherein the second nodes are physical nodes  
12       wherein the second capacity values depending on a data processing speed, a data  
13       handling speed and/or a buffering capacity related to the assigned second node  
14       functions.
- 15       4.    A router device for determining a data path from a start node to an end node over a  
16       network,  
17       wherein the network comprises first nodes each capable to perform one or more  
18       first node functions,  
19       wherein one or more of said first node functions are to be applied on said data while  
20       forwarding said data through the network, said one or more of said first nodes  
21       comprise one or more second nodes each of the second nodes assigned to one of the  
22       first nodes is capable to perform one or more second node functions, wherein said  
23       first node functions of the first nodes are provided by said one or more second node  
24       functions, the router comprising:
- 25           - a first data path determining means to determine a number of data path options  
26       through the first nodes for each data path option, the first nodes having one or

1 more assigned first node functions,  
2 - a first means for determining the minimum overall capacity value of any of said  
3 first data path options regarding first capacity values for each of said first nodes  
4 and for each of said first node functions and/or combinations of said first node  
5 functions;  
6 - receiving means for receiving said first capacity values for each of said first  
7 nodes and for each of said first node functions and/or combinations of said first  
8 node functions.

9 5. A router device according to claim 4 further comprising a request transmitting  
10 means for sending a request for first capacity values for each of said first nodes and  
11 for each of said first node functions and/or combinations of said first node functions  
12 to each of said first nodes.

13 6. A network node comprising:  
14 - at least one subnode, each subnode being able to execute at least one function,  
15 wherein a subnode capacity value is assigned to each subnode and to each function  
16 related to the respective subnode,  
17 - a request receiving means to receive a request for providing overall capacity  
18 values related to a set of at least one specific function able to be executed by the  
19 network node,  
20 - a data path determining means to determine a number of data path options for  
21 each of the functions of the set of at least one specific function to be executed by  
22 the network node,  
23 - capacity determining means to determine an overall capacity value for each of the  
24 data path options and for each of the functions of said set of at least one specific  
25 function to be performed in the network node, wherein said overall capacity values  
26 of each data path option are determined with regard to said subnode capacity values  
27 provided for each of said subnodes and for each of said assigned specific functions;

1           and  
2           - transmitting means for transmitting a minimum overall capacity value for each of  
3           the specific functions of the set of one or more specific functions and for the  
4           assigned data path option as the requested overall capacity value.

5       7.       An article of manufacture comprising a computer usable medium having  
6       computer readable program code means embodied therein for causing data path  
7       optimization and data forwarding, the computer readable program code means in said  
8       article of manufacture comprising computer readable program code means for causing a  
9       computer to effect the steps of claim 1.

10      8.       A program storage device readable by machine, tangibly embodying a program of  
11      instructions executable by the machine to perform method steps for optimizing a data  
12      path and forwarding data, said method steps comprising the steps of claim 1.

13      9.       An article of manufacture comprising a computer usable medium having  
14      computer readable program code means embodied therein for causing data path  
15      optimization and data forwarding the computer readable program code means in said  
16      article of manufacture comprising computer readable program code means for causing a  
17      computer to effect the steps of claim 2.

18      10.     A program storage device readable by machine, tangibly embodying a program of  
19      instructions executable by the machine to perform method steps for optimizing a data  
20      path and forwarding data, said method steps comprising the steps of claim 2.

21      11.     An article of manufacture comprising a computer usable medium having  
22      computer readable program code means embodied therein for causing data path  
23      optimization and data forwarding the computer readable program code means in said  
24      article of manufacture comprising computer readable program code means for causing a

1 computer to effect the steps of claim 3.

2 12. A program storage device readable by machine, tangibly embodying a program  
3 of instructions executable by the machine to perform method steps for optimizing a data  
4 path and forwarding data, said method steps comprising the steps of claim 3.

5 13. A computer program product comprising a computer usable medium having  
6 computer readable program code means embodied therein for causing router functions,  
7 the computer readable program code means in said computer program product comprising  
8 computer readable program code means for causing a computer to effect the functions of  
9 claim 5.

10 14. An apparatus comprising means for optimizing a data path and means for  
11 forwarding data from a start node to an end node over a network,  
12 wherein the network comprises first nodes, each first node being capable  
13 to perform one or more first node functions,  
14 wherein one or more of said first node functions are to be applied on said  
15 data while forwarding said data through the network,  
16 wherein a number of data path options through the first nodes are  
17 determined, for each data path option, the first nodes, having one or more  
18 assigned first node functions,  
19 wherein a first capacity value for each of said first nodes and for each of  
20 said first node functions and/or combinations of said first node functions  
21 are provided; and  
22 wherein the data is forwarded through the data path which is determined  
23 by the data path option having a minimum overall capacity regarding the  
24 first capacity values;  
25 characterized in that said one or more of said first nodes comprises one or more  
26 second nodes each of the second nodes assigned to one of the first nodes is

1           capable to perform one or more second node functions, wherein said first node  
2           functions of the first nodes are provided by said second node functions,  
3           wherein providing one of said first capacity values for one specific first node and  
4           for one specific first node function and/or one specific combination of said first  
5           node functions, comprising:  
6           - means for determining a number of second data path options for the second  
7           nodes of the one specific first node to perform said one specific first node  
8           function, for each second data path option, the second nodes having one or more  
9           assigned second node functions,  
10          - means for providing second capacity values for each of said second nodes and  
11          for each of said assigned second node functions;  
12          - means for determining the overall capacity values of said second data path  
13          options with regard to the second capacity values;  
14          - means for determining the minimum overall capacity value of any of said second  
15          data path options; and  
16          - means for providing the minimum overall capacity value as the first capacity  
17          value.

18    15.     A computer program product comprising a computer usable medium having  
19    computer readable program code means embodied therein for causing data path  
20    optimization and data forwarding, the computer readable program code means in said  
21    computer program product comprising computer readable program code means for  
22    causing a computer to effect the functions of claim 14.